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10/082,113	02/26/2002	Shoichi Hirota	500.41256X00	3518

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EXAMINER	
DI GRAZIO, JEANNE A	
ART UNIT	**PAPER NUMBER**
2871	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/082,113	HIROTA ET AL.	
	Examiner	Art Unit	
	Jeanne A. Di Grazio	2871	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 January 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 Febraury 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claims

Independent claims 1 and 16 have been amended. Dependent claims 28, 29, 34 and 35 have been amended to correct minor informalities. Claims 1-37 are pending.

Priority

Priority to Japanese Patent Application No. 2001-298974 (Sept. 28, 2001) is claimed.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubo et al. (US 2001/0024257) in view of Dir et al. (US 4,767,190).

As to claims 1 and 16: Kubo teaches and discloses, referring to Figure 57, a display operation when a voltage is applied across a liquid crystal layer in a reflection region of the liquid crystal display device. Kubo teaches at least a liquid crystal display element comprising: a reflection substrate (1000) [0016], a transparent substrate (101, 121) [0137], and a liquid crystal layer interposed between said two substrates (30), wherein a plurality of pixels and active elements for driving the liquid crystal at the plurality of pixels, are incorporated to at least one of the two substrates [0009], and illustrates that an optical axis of an incident light beam upon the liquid crystal layer is present in a plane which is substantially perpendicular to a direction of orientation of liquid crystal molecules on at least one of the two substrates (liquid crystal molecule, 30a)(referring to the left hand side of the Figure 57), and the incident light impinges upon the liquid crystal layer in a direction which is inclined by a predetermined angle to the direction of the normal line of the substrate (Figure 57).

Kubo does not appear to explicitly specify an optical axis of an emergent light beam from the liquid crystal layer is in a plane which is substantially perpendicular to a direction of orientation of liquid crystal molecules on at least one of the two substrates.

Dir teaches and discloses a transient state liquid crystal image bar with contrast enhancement (Title, entire patent). Dir illustrates in Figure 2, incoming light vectors (23) and emerging light vectors (23) that appear to be oriented in a plane perpendicular to the direction of homogeneously aligned liquid crystal molecules (Dir claim 2, Lines 29-30). Dir claims (claim 2) that such an arrangement reduces drive voltage (Dir claim 2, Line 37).

Dir is evidence that ordinary workers in the field of liquid crystals would have had the reason, suggestion and motivation to control the direction of incident and emergent light from a

homogeneously aligned liquid crystal material for the purpose of at least reducing the drive voltage (Dir claim 2).

Optimization of a results effective variable requires only routine skill in the art (MPEP 2144.05 II).

Therefore, it would have been obvious to one of ordinary skill in the art of liquid crystals at the time the invention was made to modify Kubo in view of Dir for at least reducing the drive voltage of a liquid crystal display.

Claims 2, 13, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubo et al. (US 2001/0024257 A1) in view of Dir et al. (US 4,767,19) and further in view of Melnick et al. (US 6,348,959 B1).

Per claims 2, 13, and 17: Kubo has the LC layer driven by an electric field component which is mainly parallel to the substrate (Figure 1B) and switching made between directions of orientation of the LC molecules in two states (Figure 1B).

Kubo does not appear to explicitly specify that a polarization direction of an incident light beam upon the LC layer is substantially perpendicular or parallel to the direction of LC molecular orientation.

Melnick teaches that by choosing the orientation direction of the LC molecules on the side of a polarizing means to be substantially parallel to the direction of polarization of incident light or by choosing this orientation direction to be perpendicular to the polarization direction, it is only necessary to compensate for the birefringence due to a non-reorientable surface layer of LC on the side of the reflecting means (Col. 4, Lines 5-11). In Melnick, this configuration is

chosen in part to reduce drive voltage and maintain high contrast and for faster switching (Col. 3, Lines 62-67 and Col. 4, Lines 1-11).

It would have been obvious to one of ordinary skill in the art of liquid crystals at the time the invention was made to modify Kubo in view of Melnick to reduce drive voltage while maintaining high contrast and for faster switching.

Claims 3-6, 18-21, 30, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubo et al. (US 2001/0024257 A1) in view of Dir et al. (US 4,767,190) in view of Melnick et al. (US 6,348,959 B1) and further in view of Okada (US 6,542,211 B1).

Per claims 3, 4, 18, 19, 30, and 31: Kubo has the LC layer driven by an electric field component which is mainly parallel to the substrate (Figure 1B) and switching made between directions of orientation of the LC molecules in two states (Figure 1B).

Kubo does not appear to explicitly specify homogeneous and homeotropic orientations.

Okada has an LCD device and driving method and homogeneous and homeotropic LC orientations (Col. 3, Lines 16-40). In Okada, these alignments are useful for providing an LCD with a lower re-bending voltage and lower holding voltage for holding or retaining bend alignment (Col. 1, Lines 64-67).

It would have been obvious to one of ordinary skill in the art of liquid crystals at the time the invention was made to modify Kubo in view of Okada for a lower re-bending voltage and lower holding voltage.

Per claims 5, 6, 20, and 21: It may be implied in Kubo, that an angle between an optical axis of an optical path in the LC layer and the direction of the normal line of the substrate is set to be larger than a total reflection angle upon emanation of the light beam from the substrate into

the air (Figure 57) for a display that uses a phenomenon that the polarization or amount of light passing through the LC layer changes along with the change in the orientation of the LC layer [0137] for the purpose of reducing drive voltage.

Claims 7, 8, 22, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubo et al. (US 2001/0024257 A1) in view of Dir et al. (US 4,767,190) in view of Melnick et al. (US 6,348,959 B1) in view of Okada (US 6,542,211 B1) and further in view of Kitagishi Nozomi (JP-07-318861).

Per claims 7, 8, 22, and 23: Kubo does not appear to explicitly specify that an angle between an optical axis of an optical path in the LC layer and the direction of the normal line of the substrate is set to be not less than a Brewster angle between the substrate and the air.

Nozomi has a polarizing element and projector for which incident light is approximately the same as a Brewster angle with an optical axis (PAJ). In Nozomi, this configuration is used for polarizing and light separating efficiency.

It would have been obvious to one of ordinary skill in the art of liquid crystals at the time the invention was made to modify Kubo in view of Nozomi for polarizing and light separating efficiency.

Claims 9-12, and 24-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubo et al. (US 2001/0024257 A1) in view of Dir et al. (US 4,767,190) in view of Melnick et al. (US 6,348,959 B1) in view of Okada (US 6,542,211 B1) and further in view of Ichikawa et al. (US 6,473,144 B1).

Per claims 9-12, and 24-27: Kubo does not appear to explicitly specify a hologram element (or diffraction grating) for pixels whereby p-polarized light is not substantially

diffracted, but an s-polarized light beam generated after modulation by the LC layer is diffracted to a direction substantially perpendicular to the LC element.

Ichikawa has a hologram color filter including a blazed holographic diffraction grating for a hologram that has both a dispersing and converging function or only a dispersing function (Col. 3, Lines 45-53). In Ichikawa, s-polarized light is incident on the hologram color filter (Col. 4, Lines 55-56) and appears to be substantially perpendicular to the LC element (Figure 1). In Ichikawa, the hologram color filter diffractively disperses incident light to emanate light rays in different wavelength regions at a predetermined spatial period (Col. 2, Lines 53-65) for excellent color reproduction and to prevent uneven color (Col. 5, Lines 5-8).

It would have been obvious to one of ordinary skill in the art of liquid crystals at the time the invention was made to modify Kubo in view of Ichikawa for excellent color reproduction and to prevent uneven color.

Claims 14, 15, 32, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubo et al. (US 2001/0024257 A1) in view of Dir et al. (US 4,767,190) in view of Melnick et al. (US 6,348,959 B1) and further in view of Tanaka (US 5,895,108).

Per claims 14, 15, 32, and 33: Kubo does not appear to explicitly specify ferroelectric and antiferroelectric material to be used as the liquid crystal material.

Tanaka suggests that an antiferroelectric and ferroelectric liquid crystal may used because they require a low voltage when switching among antiferroelectric and ferroelectric states (Col. 2, Lines 45-63).

It would have been obvious to one of ordinary skill in the art of liquid crystals at the time the invention was made to modify Kubo in view of Tanaka for reduced drive voltage when switching among various liquid crystal states.

Claims 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubo et al. (US 2001/0024257 A1) in view of Dir et al. (US 4,767,190) in view of Melnick et al. (US 6,348,959 B1) in view of Okada (US 6,542,211 B1) and further in view of Inoko (US 6,417,941 B1).

Per claims 28 and 29: Kubo does not appear to explicitly specify incident and emergent side hologram elements where the incident side hologram diffracts an emergent light beam substantially perpendicular to a substrate and an emergent side hologram diffracts the emergent light beam having a polarization orthogonal to the polarization of the incident light beam.

Inoko has a component of light passing through the first hologram element after diffraction and the polarization directions are perpendicular to each other (Col. 2, Lines 10-31). Inoko has such a configuration for splitting of light with high accuracy and to prevent the unnecessary absorption of light that may internalize to heat (Id.). Such a display is reliable and has a long service life (Id.).

It would have been obvious to one of ordinary skill in the art of liquid crystals at the time the invention was made to modify Kubo in view of Inoko for accurate light splitting without the unnecessary absorption of light and for a display that is reliable and that has a long service life.

Claims 34-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubo et al. (US 2001/0024257 A1) in view of Dir et al. (US 4,767,190) and further in view of Miyake et al. (US 5,729,306).

Per claims 34-37: Kubo has, referring to Figure 57, a liquid crystal display element comprising: a reflection substrate (1000) [0016], a transparent substrate (101, 121) [0137], and a liquid crystal layer interposed between said two substrates (30), wherein a plurality of pixels and active elements for driving the liquid crystal at the plurality of pixels, are incorporated to at least one of the two substrates [0009], and illustrates an optical axis of an incident light beam upon the liquid crystal layer is present in a plane which is substantially perpendicular to a direction of orientation of liquid crystal molecules on at least one of the two substrates (liquid crystal molecule, 30a)(referring to the left hand side of the Figure 57), and the incident light impinges upon the liquid crystal layer in a direction which is inclined by a predetermined angle to the direction of the normal line of the substrate (Figure 57).

Kubo does not appear to explicitly specify a color separation and color synthesizing optical system; however, Miyake has a light splitting and synthesizing device as illustrated, for example, in Figure 18. In Miyake, the light source optical axis and projection lens are on different levels and parallel (Figure 18 and Figure 35).

Miyake has a polarized beam splitter for splitting a white light into polarized beams having polarizations different from each other (Col. 4, Lines 49-54) corresponding to three primary colors (Col. 17, Lines 44, 51, and 60) and the colors are incident on the LCD panels (Figure 18, LCDs 222, 223, and 224) obliquely on hologram plates (Figure 14).

In Kubo, the display is produced by changing polarization or amount of light passing through a liquid crystal layer based on changes in the LC molecular orientation [0137] such that a high drive voltage is not required.

In Miyake, the invention is directed to a light splitting and synthesizing device for aligning different polarization directions of the light emitted by a light source to prevent chromatic aberration and for a high luminance display that is small and easy to produce (Col. 6, Lines 35-42).

It would have been obvious to one of ordinary skill in the art of liquid crystals at the time the invention was made to modify Kubo in view of Miyake for a splitting and synthesizing device requiring a low drive voltage that can be manufactured easily and that prevents chromatic aberration.

Response to Arguments

Applicant's arguments with respect to claims 1 and 16 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeanne A. Di Grazio whose telephone number is (571)272-2289. The examiner can normally be reached on M-F.

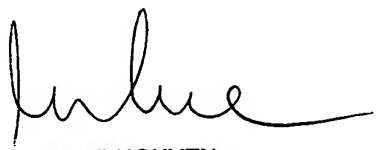
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (571)272-2293. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jeanne Andrea Di Grazio

Patent Examiner
Art Unit 2871

Robert Kim, SPE



DUNG T. NGUYEN
PRIMARY EXAMINER